Exchange Modeling

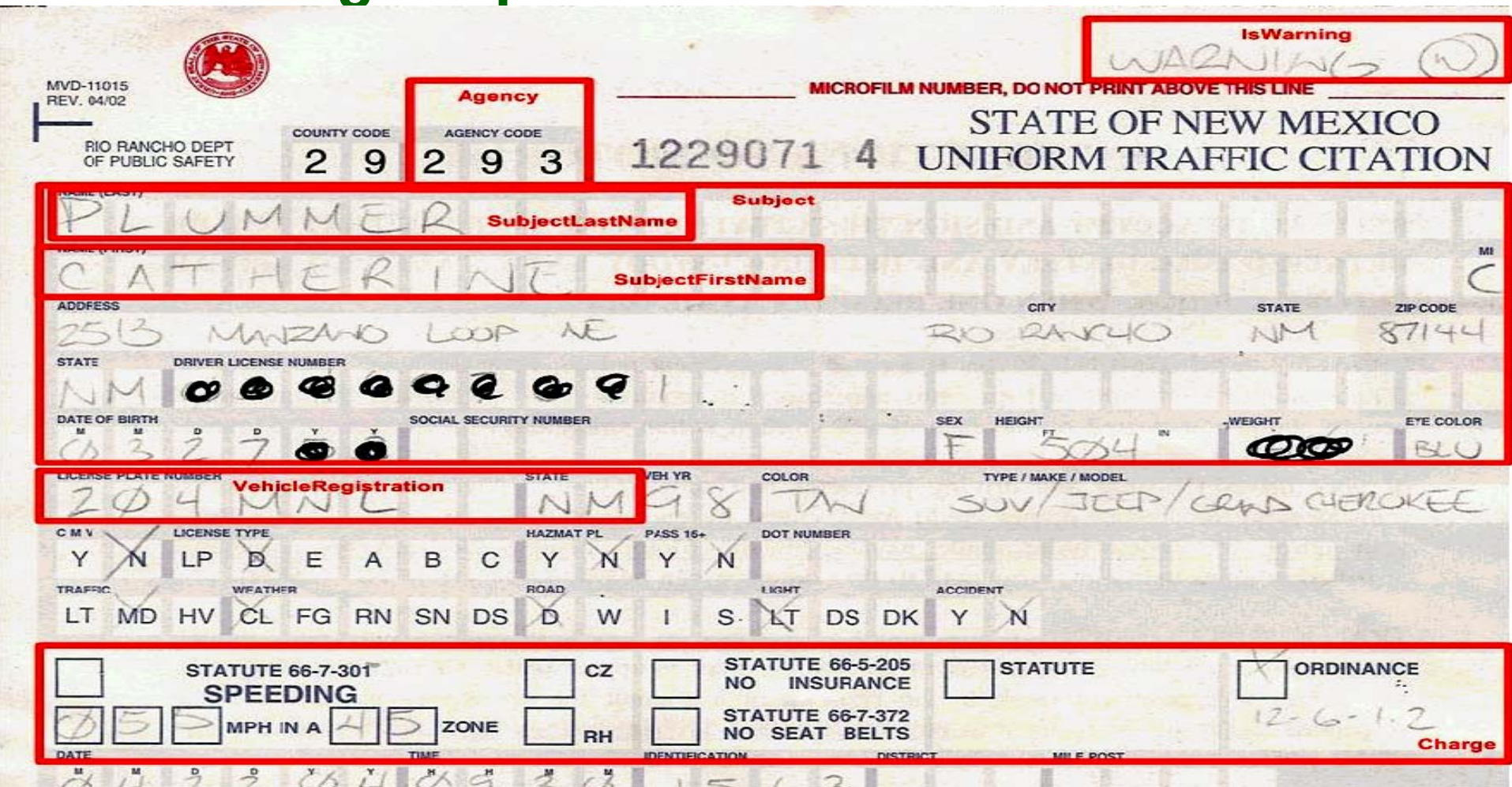
Overview

- Explain why exchange modeling is an important part of the IEPD process
- Describe various options for exchange modeling and the pros and cons of each
- Define the elements of an exchange model, including
  - Classes and attributes
  - Associations
  - Cardinality
  - Inheritance/specialization
- Understand exchange modeling tools that support open standards, such as Visio and ArgoUML

Motivation

- In building an IEP, it is critical to have
  - Precise definition/description of exchange structure
    - Not limited paper documents
  - Description that can be understandable and verifiable by all stakeholders (bridge the communication gap)
  - Description technique that facilitates interactive design

Gathering Requirements



UML—How Much?

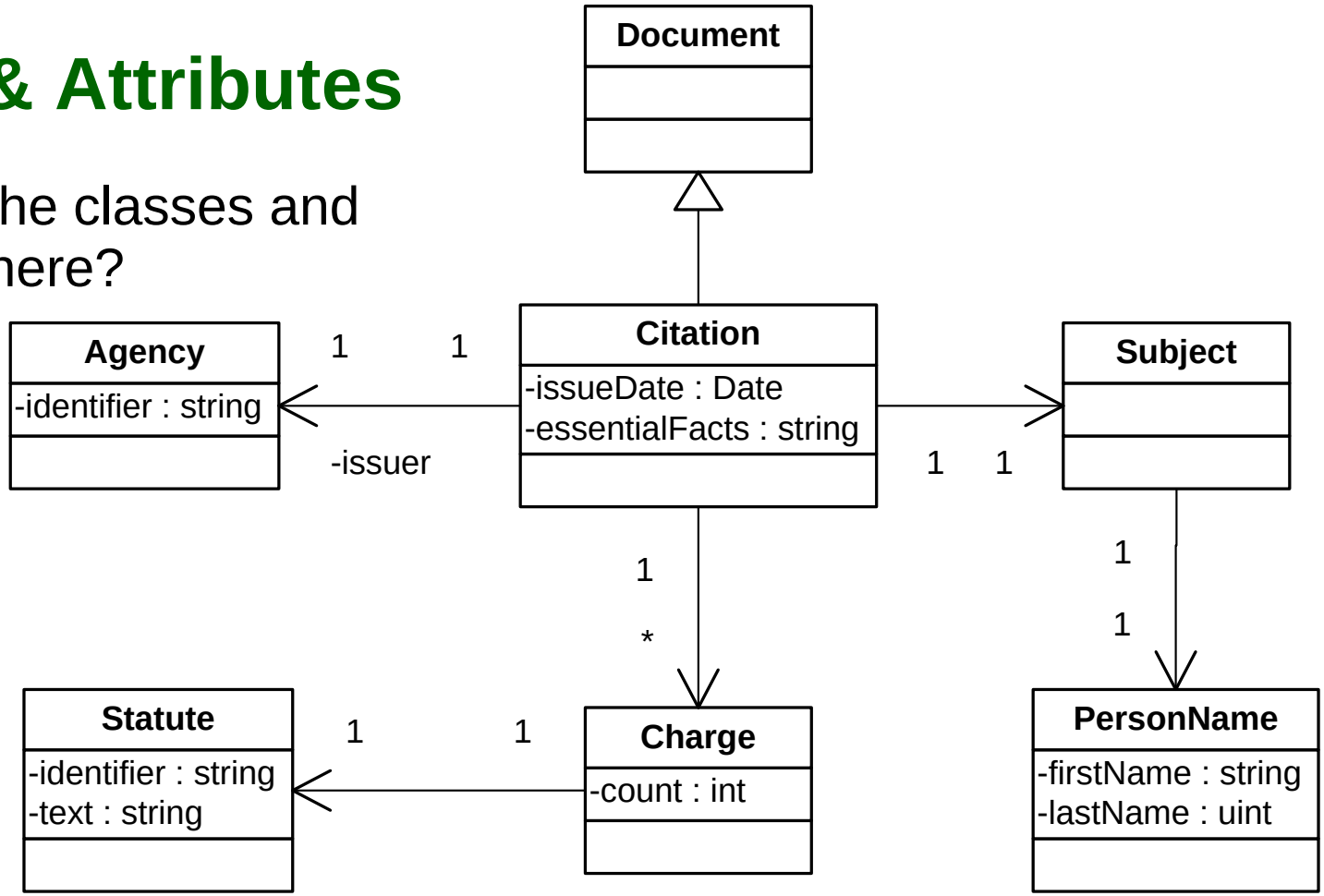
- UML is an extensive specification for modeling
- Most of it is not relevant to modeling exchange document structure
- Focus on "static structure"—class diagrams

Classes and Attributes

- **Classes** are found by listening for ***nouns*** in descriptions of the domain
- Example
  - Police officer issues a citation to a subject on behalf of an agency
  - Each citation documents one or more charges, which refer to statutes
- Each class has characteristics called **attributes**
- Attributes are what define the thing

Classes & Attributes

- What are the classes and attributes here?

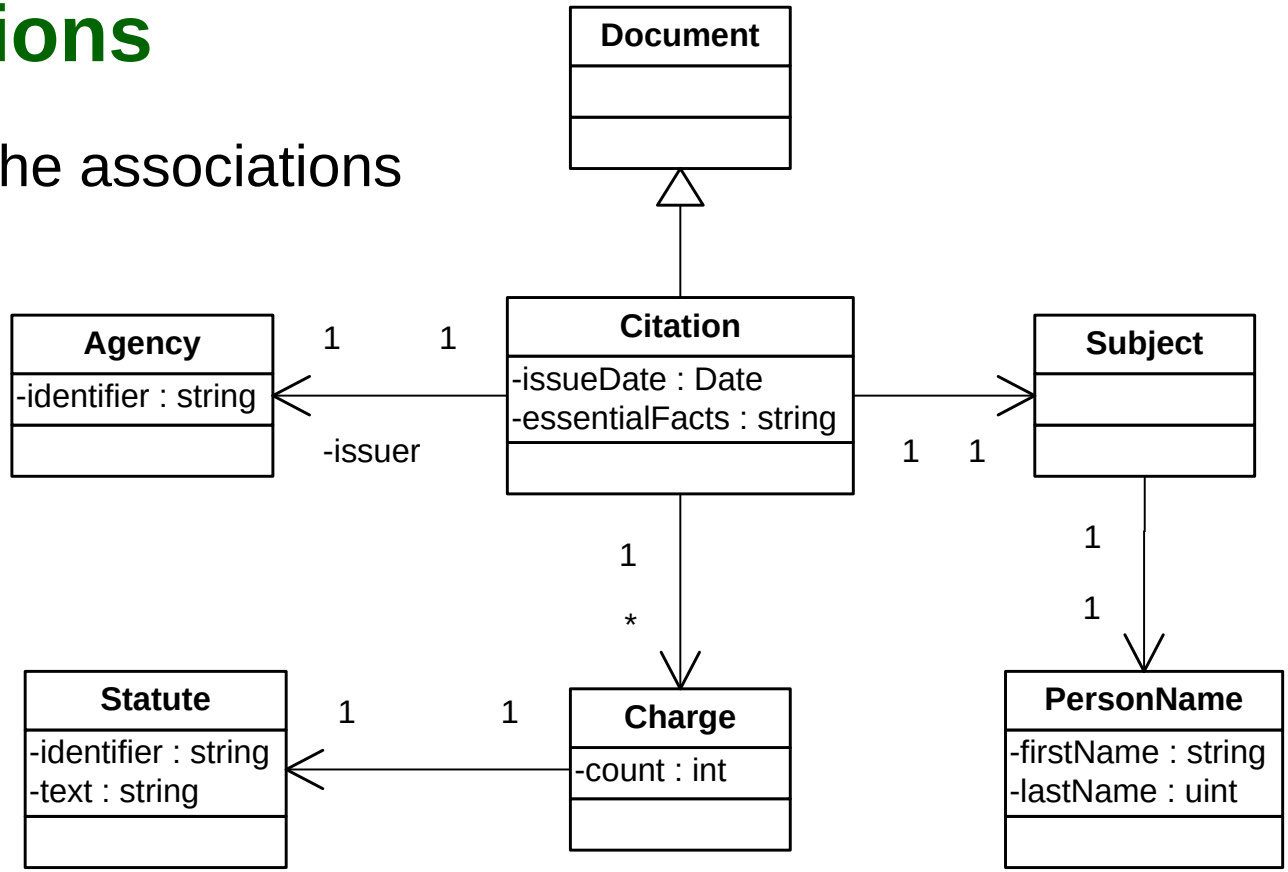


Associations ("has a")

- Describe how classes relate to one another
- Example
  - Police officer issues a citation on behalf of an agency
- Associations can be verbs from exchange or simply descriptions of relationships
- When modeling hierarchical document structures, associations are **navigable** (unidirectional)
- Associations are indicated with open-ended arrows
- Can be named; if not, read as "relates to," "contains," or "has"

Associations

- What are the associations here?

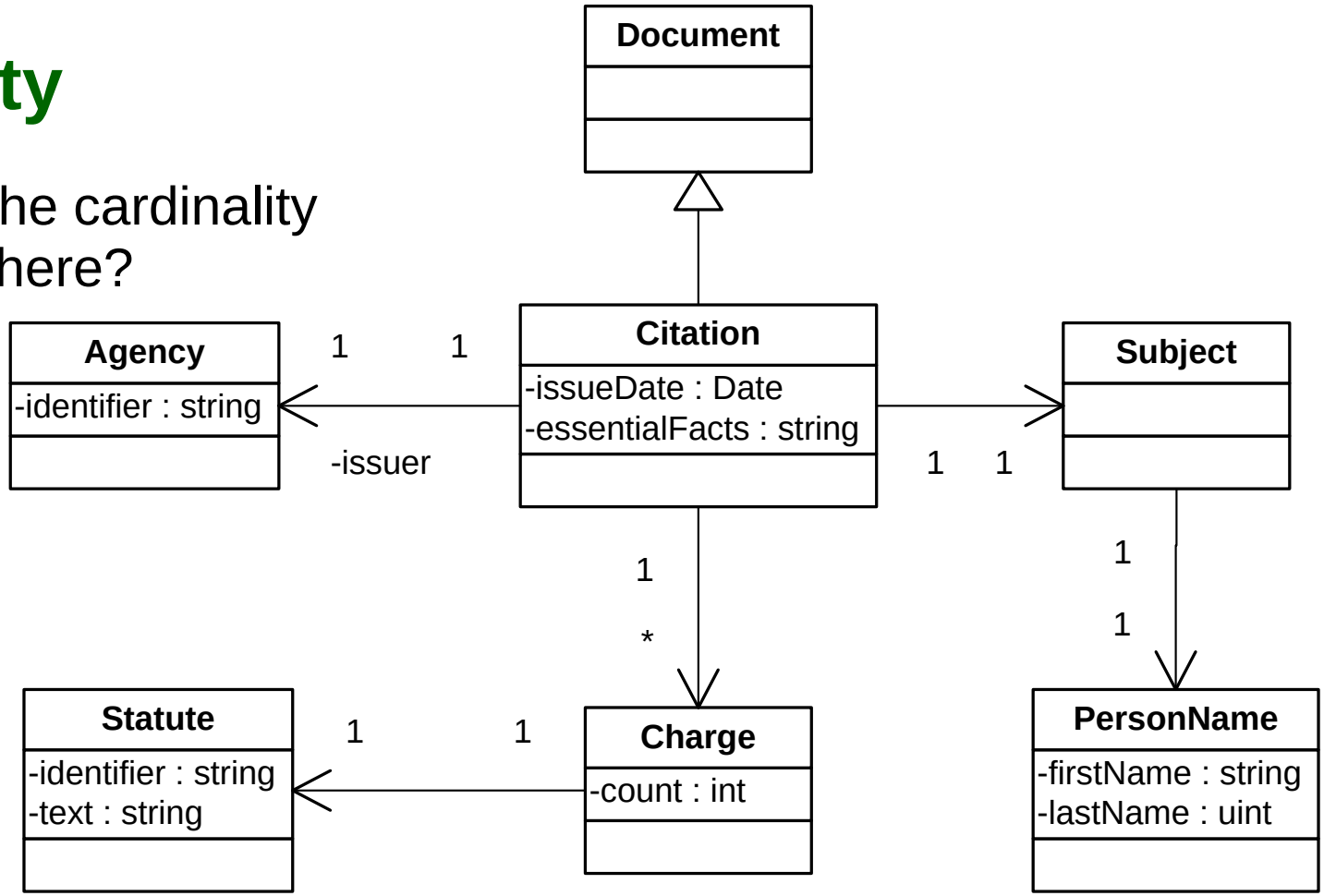


Cardinality

- Cardinality documents the quantitative aspects of associations
- How many of one thing relates to how many of another
- Example
  - Police officer issues one citation to one subject
  - Each citation documents one or more charges
- Indicated with lower and upper bound numbers (similar to min/max occurs in XML Schema)

Cardinality

- What are the cardinality indicators here?

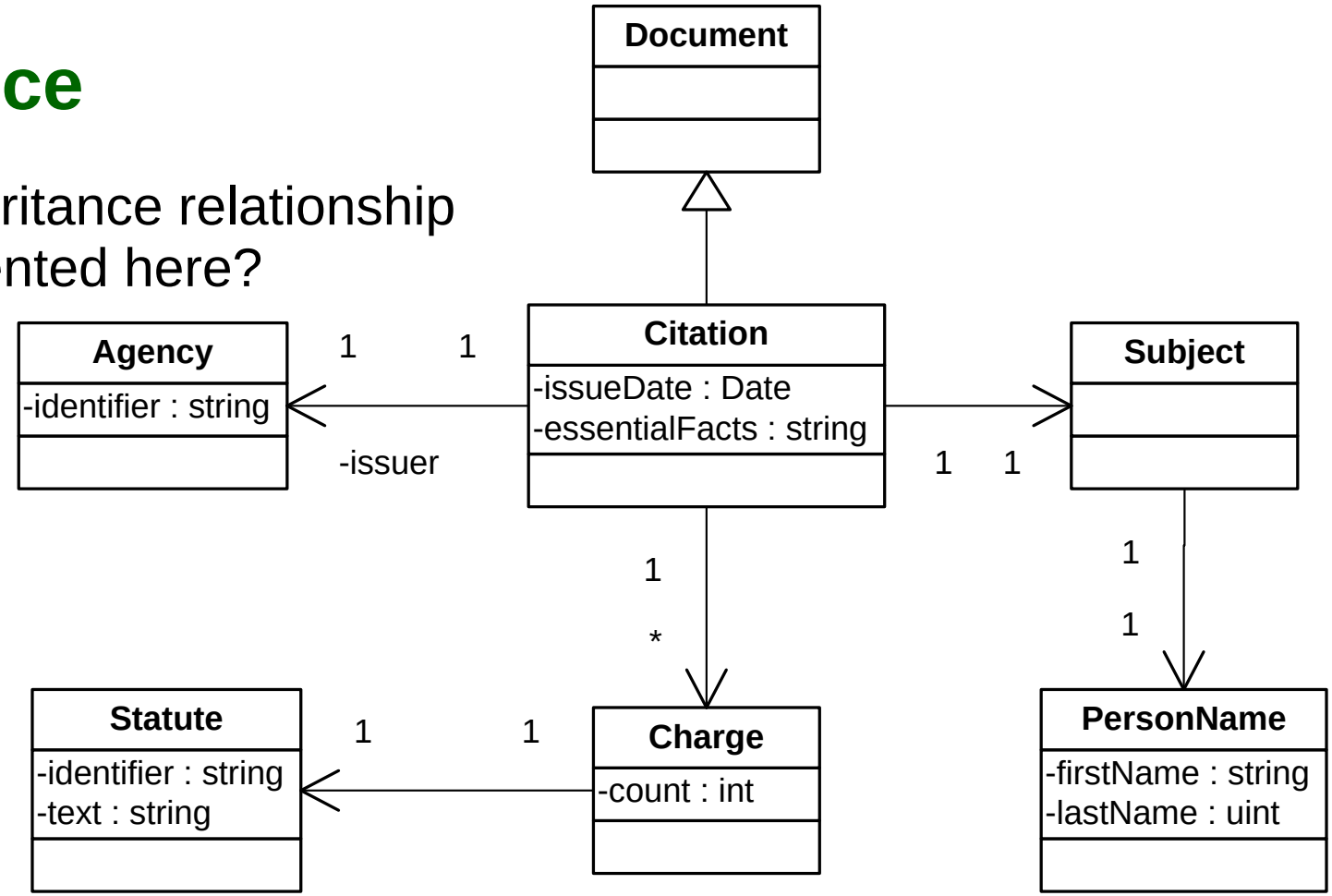


Inheritance

- Inheritance is used to document generalization/ specialization relationships
- Should only be used when one thing is truly a special kind of some other thing
- Inheritance is generally over-used
- Important not to confuse with role-played-by relationships or simply shares-attributes-with relationships
- Indicated with closed-end arrow

Inheritance

- What inheritance relationship is documented here?



More Robust Example

- AMBER Alert Reference IEP
- Models available for download from the Justice Standards Clearinghouse at http://niem.gov/iepd/

Sharing UML Via XMI

- The IEPD process does not explicitly mention using XMI output
- However, we strongly encourage you to include that as an artifact

NIEM as Source of Exchange Concepts

- NIEM contains 600 nouns (complex types)
  - Use these if they fit—do not reinvent the wheel
  - Do not use them if they do not fit—do not restrict your exchange model to what is in NIEM
- Remember—build a model that the business people can understand and agree to

Hiring the Right Help

- If you hire a facilitator or tech expert, require
  - Specific process steps in RFPs
  - UML modeling
  - Tools that produce open artifacts
  - Object-oriented domain modeling experience
  - Facilitator or technical expert to provide mentoring
- Support your facilitator/technical experts with the right work group members

Semantic Definitions

- In addition to determining a model describing the classes and associations, it is critical to capture the precise semantic meaning of each
  - Class
  - Attribute
  - Association
- Most UML tools have a means of capturing the relevant semantic documentation of each

Exchange Modeling Practical Exercise

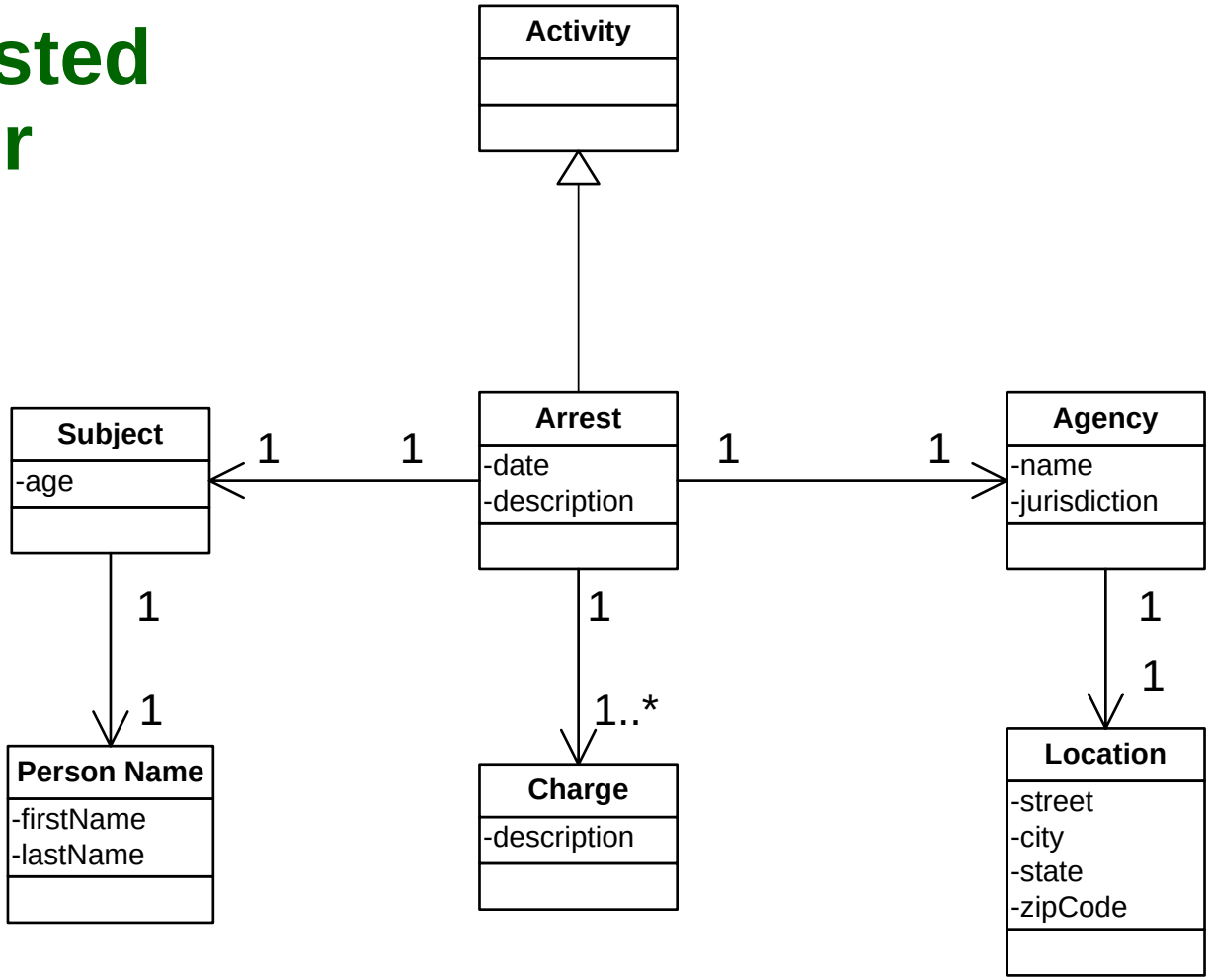
Use UML to model the following scenario

Remember—the NIEM can be a good source of domain concepts but should not be the only source

Law Enforcement Scenario

- An arrest
  - Is a specialized type of activity
  - Has a date and description
  - Has one subject associated with it—the subject has a first name, last name, and age
- A law enforcement agency must be associated with each arrest; the agency has a name and jurisdiction
- Agency has a location, including street, city, state, and zip
- Arrest must be associated with one or more charges and each charge needs a description

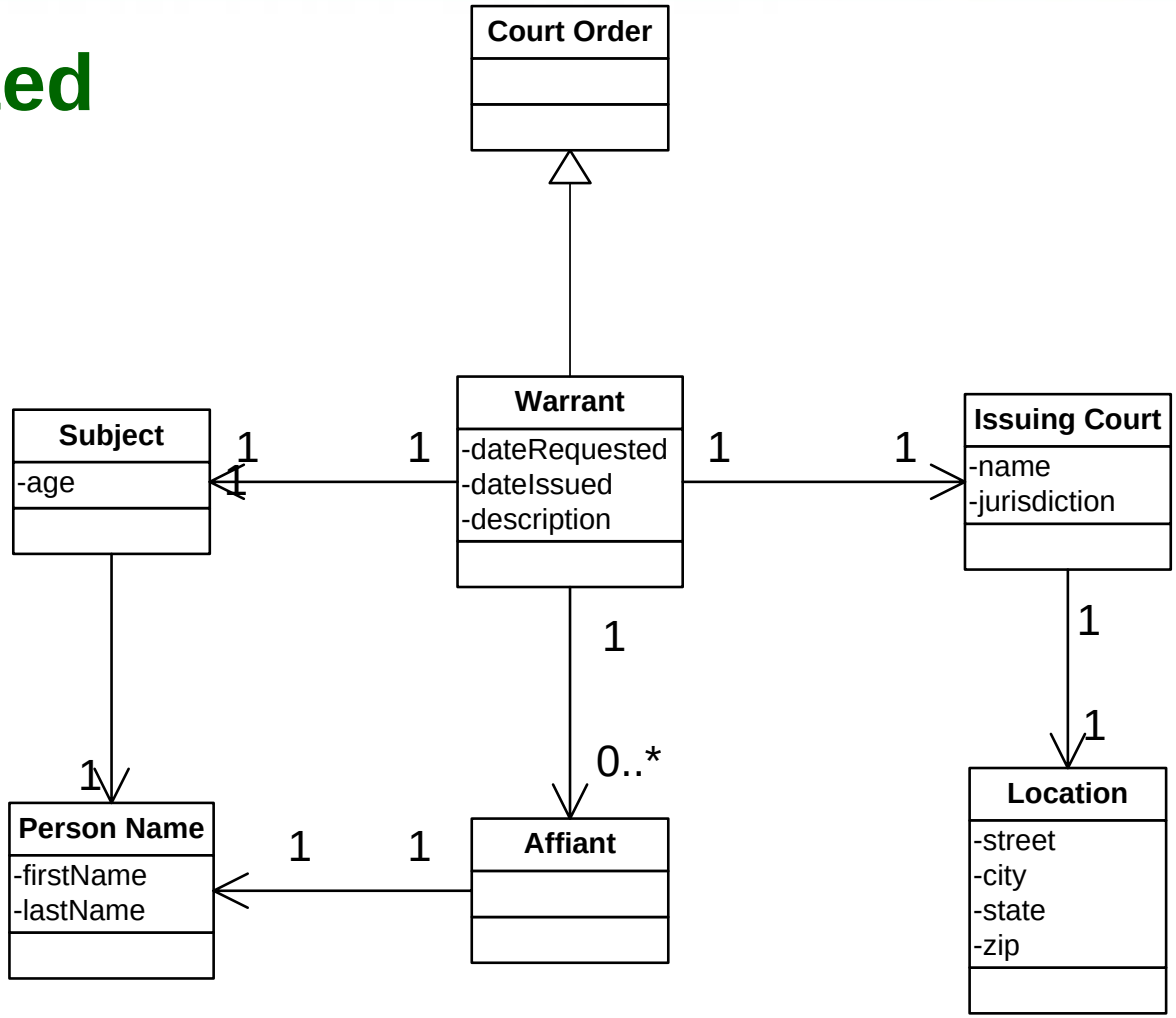
Suggested Answer



Courts Scenario

- A warrant
  - Is a specialized type of court order
  - Must have a date requested, date issued, and a description
- There must be an issuing court for each warrant; the court must have a name and jurisdiction
- Court has a location, including street, city, state, and zip
- Warrant must have a subject. The subject has a first name, last name, and age
- Warrant may have several affiants. If so, the affiant has a first name and last name

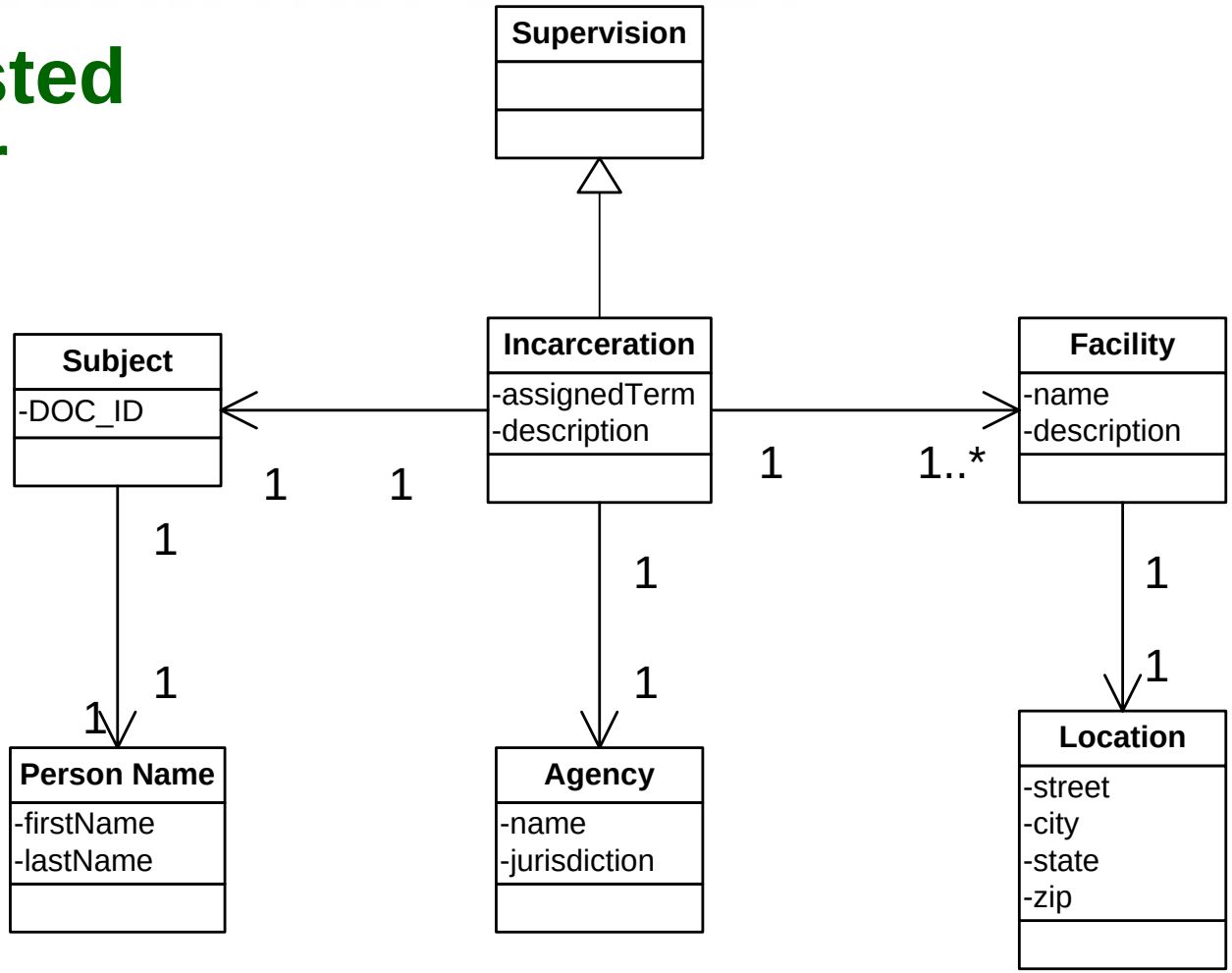
Suggested Answer



Corrections Scenario

- Incarceration is a specialized type of supervision
- An incarceration
  - Must have an assigned term and description
  - Has a subject—the subject has a first name, last name, and DOC ID number
  - Is associated with one agency—each agency has a name and jurisdiction
  - Is associated with one or more facilities—each facility has a name and description
- The facility has a location, including street, city, state, and zip

Suggested Answer

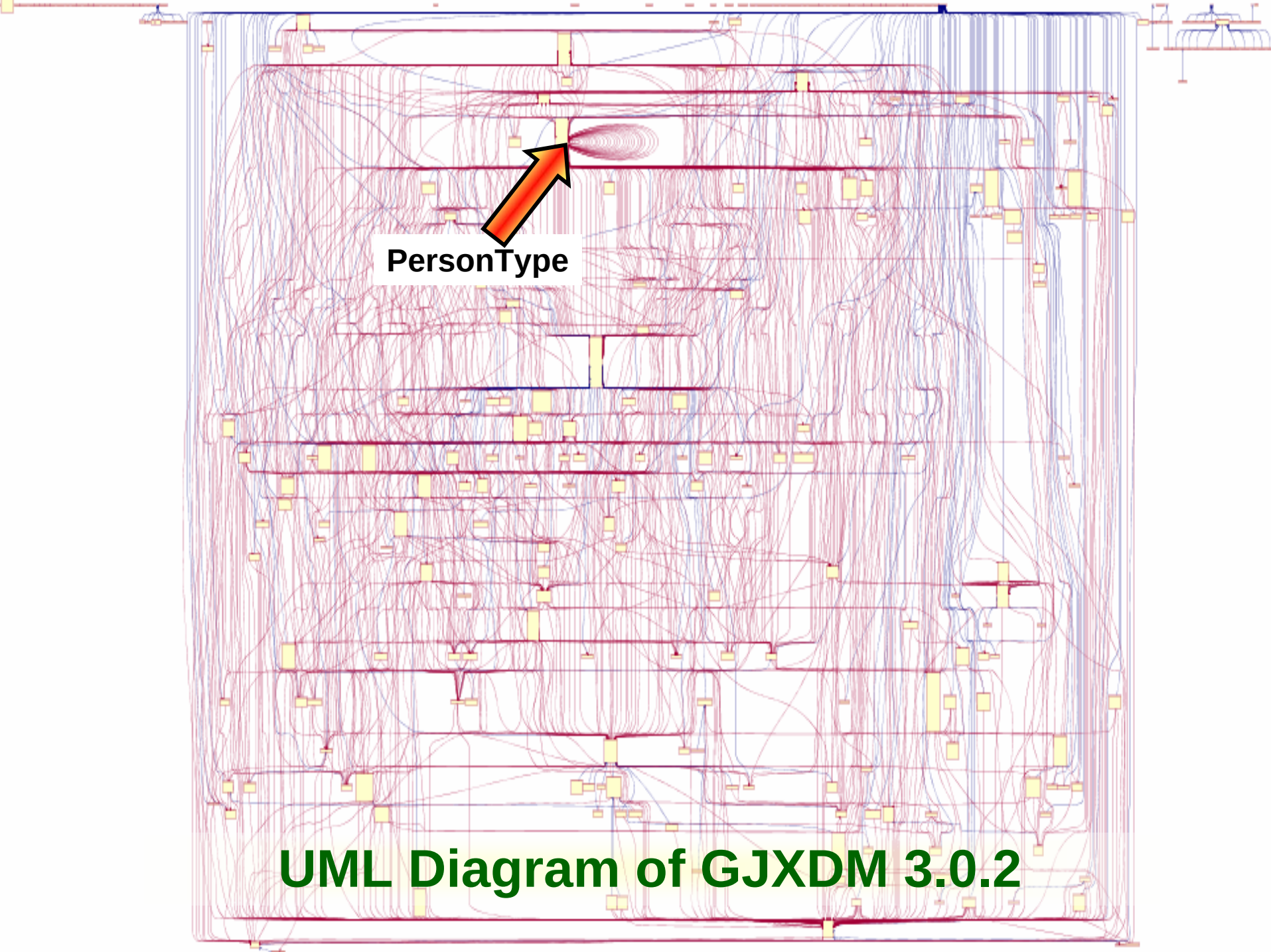


Final Thoughts

- Domain modeling is a very useful communication device
- It is not difficult, but experience helps
- Training can help newcomers learn UML and a tool; modeling can only be learned by experience

UML Resources

- Information Exchange Package Documentation guidelines
- Process Overview white paper (justiceintegration.com, adopted by IJIS XML Advisory Committee)
- *Domain-Driven Design* by Eric Evans
- *UML Distilled* by Martin Fowler
- *Analysis Patterns* by Martin Fowler
- *Modeling XML Applications With UML* by David Carlson
- *Object-Oriented Design Heuristics* by Arthur Riel



UML Diagram of GJXDM 3.0.2